RSIC Newsletter

RADIATION SHIELDING INFORMATION CENTER

OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION • FOR THE U.S. ATOMIC ENERGY COMMISSION

POST OFFICE BOX X •
OAK RIDGE, TENNESSEE 37831

No. 99 February 1973

For every problem there is a solution:
Simple, neat and wrong.
....H. L. Mencken

RSIC ACTIVITIES IN 1972

The annual statistical roundup reveals a 20% increase in requests made of RSIC in CY 1972 over that of the previous year. A total of 2775 separate letters/telephone calls (about 10.6 each working day) requesting a variety of services were processed during the year. On an average, the following dissemination activities took place each working day.

2.5 code packages were shipped
1.3 data packages were shipped
3.8 responses to inquiries about codes, including requests for assistance in trouble shooting problems encountered in their use, were given
1.3 responses to data inquiries were made
1.9 responses to general inquiries for shielding information in which technical advice was given
1.9 responses to inquiries which were non-trivial, requiring research, use of the computer to do calculations, and technical consultation to satisfy the requests
4.9 shielding documents (including both hard copy and microfiche) were mailed - in addition to those included in code and data packages

In addition to the routine selective dissemination of information (SDI) service (375 people currently), special searches of the literature were made (166) for individual requesters during the year. The RSIC Newsletter is currently being mailed to 1373 people.

REDUCTION IN NUCLEAR PROPULSION AND POWER PROGRAMS AT NASA-LEWIS

The following item has been provided to RSIC:

Starting January 5, 1973 essentially all of NASA-LEWIS' current nuclear propulsion and nuclear power programs will be terminated as soon as possible in an orderly fashion. This means closing down the 60 MW test reactor at Plum

Brook Station immediately and terminating all functions of the Nuclear Systems Division. Accompanying this action is a scheduled reduction in force of some 400 people by June 1973 and an additional 300 people by June 1974.

FIRST CALL FOR PAPERS
IEEE CONFERENCE ON NUCLEAR AND SPACE RADIATION EFFECTS

July 23-26, 1973 Logan, Utah

Sponsored by the IEEE/G-NS Radiation Effects Committee in cooperation with Utah State University, the Conference will be held on the campus of the Utah State University, Logan, Utah. It will cover theoretical and experimental studies of nuclear and space radiation effects on materials, components, circuits, and electronic systems. The program will consist of six to eight sessions of contributed papers, and a number of invited papers to be presented by recognized authorities in radiation effects and allied fields. Papers describing significant contributions in the following or related areas are invited:

- Physical Properties of Irradiated and Ion Implanted Materials
- Displacement Damage and Ionization Effects in Semiconductor Devices, Integrated Circuits, Transducers, Capacitors, Optoelectronic Devices, Lasers, etc.
- Methods of Analyzing, Predicting, Simulating, and Hardening Against Radiation Effects in Components and Systems
- Energy Deposition by Energetic Particles and Photons in Solids
- Dosimetric Techniques and Radiation Measurement Standards
- Radiation Effects Quality Assurance

Summaries must be submitted by March 30 to the 1973 Technical Program Chairman: David K. Myers, Fairchild Semiconductor, 545 Whisman Road, Mountain View, California 94040, Phone: 415-962-2015. Conference Chairman: Julian S. Nichols, AFWL/ELT, Kirtland AFB, N. M. 87117, phone: 505-247-1711, ext. 2223.

PROCEEDINGS OF ANS SESSION ON FAST REACTOR SHIELDING AVAILABLE

Proceedings are available for the session on "Fast Reactor Shielding," which was sponsored by the ANS Shielding and Dosimetry Division at the Miami Beach Winter 1971 ANS Meeting. Copies are available free of charge to S&D Division members. Non-members can obtain copies at $6.00. Requests should be made to: F. Krapp, Society Services Dept., American Nuclear Society, 244 East Ogden Ave., Hinsdale, Ill. 60521.

ELECTRONIC PROPERTIES INFORMATION CENTER (EPIC) REACTIVATED

Effective in January 1973, the Thermophysical Properties Research Center (TPRC) was assigned by the DoD the responsibility to operate the Electronic Properties Information Center (EPIC) formerly operated by the

Hughes Aircraft Co., Culver City, California. The Hughes operation which was formally discontinued on September 30, 1972, has been now transferred to TPRC and it is anticipated that normal operations can be resumed within a few months, when staffing and other logistics problems are resolved. TPRC thus will add basic electrical, electronic, electro-optical and magnetic properties to its list of thermophysical properties.

It is believed that as a result of this merger, the joint operation will result in significant cost savings. Perhaps more important, however, the user public will be served more effectively from a single point of inquiry concerning physical properties of matter which are often closely interrelated.

Efforts are underway at this time to carefully define the scope of coverage of the new EPIC. It is hoped that by a narrower delineation of properties covered, the limited available resources may be focused on producing an output of greater depth than has been possible in the past. The management of TPRC hopes that the user public on electronic properties will not be greatly inconvenienced during this transition period. Any questions or suggestions you may have concerning the new EPIC should be addressed to Dr. Y. S. Touloukian, Director, TPRC, West Lafayette, Ind. 47906; telephone 317-463-1581.

CHANGES TO CODE COLLECTION

The following codes have been changed or added to our collection. Unless noted, requests should be accompanied by a full reel (2400') of magnetic tape.

PSR-30/VIXEN — The VIXEN code package has recently been updated with versions of the code which can process all the ENDF photon production formats, including those approved in 1972 by CSEWG. The VIXEN program performs format consistency and physics checks of photon production cross section data in ENDF format. The current update was made with the assistance of staff members of NNCSC-BNL and the Theoretical Division, LASL. Reference: LA-4739 (ENDF-155). The new versions may be requested as PSR-30A/VIXEN-CDC(1/73) (for the CDC 6600) and PSR-30B/VIXEN-IBM(1/73) (for the IBM 360).

PSR-46/XLACS — Program to Produce Weighted Multigroup Neutron Cross Sections from ENDF/B for Use in XSDRN. Contributed by Oak Ridge National Laboratory. The package contains a stand alone version of the code. XLACS represents one module of the AMPX general purpose cross section processor under development at ORNL. FORTRAN IV; IBM 360/75/91. Reference: ORNL-TM-3646 (AMPX-2).

CCC-163/FISSP-CLOUD Both the IBM 360 (CCC-163A (11/72)) and CDC 6600 (-163B (11/72)) versions have been improved and minor errors corrected at the direction of J. B. Rivard and L. L. Bonzon of Sandia Laboratories, Albuquerque, New Mexico. The update and errata information for the supporting document SC-RR-70-338 are available upon request.

CCC-195/TWOTRAN Two-Dimensional Discrete Ordinates Codes with Anisotropic Scattering: four versions of TWOTRAN, all of which operate on the CDC-6600, have been received from Los Alamos Scientific Laboratory, Los Alamos, New Mexico. The basic version designated is CCC-195A, the variable weight version CCC-195B, the spherical harmonics version CCC-195C, and the first collision source version CCC-195D. Reference: LA-4600.

CCC-197/USRHYD Electron and X-Ray Energy Deposition Code System. The system includes the electron code ZEBRA (See abstract CCC-173) and the X-Ray code BIGGS. Contributors are Braddock, Dunn, and McDonald, Inc., and the U.S. Army Harry Diamond Laboratories, both of Washington, D.C. This code package was formerly designated as PSR-42. FORTRAN IV; IBM 360. Reference: HDL-044-1.

CCC-198/COHORT-II General Purpose Monte Carlo Radiation Transport Code. The COHORT series of codes, originating in NARF/General Dynamics, Fort Worth, under NASA Marshall Space Flight Center auspices, have undergone development over a period of years in several nuclear installations. This IBM 7094 version was contributed by NASA Lewis Research Center, Cleveland, Ohio. Reference: NASA-TM-D-6170.

CCC-199/MCNA Monte Carlo Adjoint Neutron Transport Code with Coupled Sampling. This CDC 6600 version was contributed by Los Alamos Scientific Laboratory, Los Alamos, New Mexico. Reference: LA-4488 and Addendum: LA-4751.

CCC-200/MCP General Purpose Monte Carlo Photon Transport Code. Operable on the CDC 6600, this was contributed by Los Alamos Scientific Laboratory, Los Alamos, New Mexico. Reference: LA-4751.

It is to be noted that the data libraries prepared for use in CCC-199/MCNA and CCC-200/MCP are currently available only in CDC 6600-compatible machine language. Code development is underway at LASL which is expected to make these code packages independent of hardware when complete and generally available.

CHANGES TO DATA COLLECTION

DLC-21/KXRAY Evaluated X-Ray Cross Section Library. Contributed by Kaman Sciences Corporation, Colorado Springs, Colorado, along with a FORTRAN IV retrieval program to list the library tape. Reference: DNA 2433F(KN-71-431(R)).and DNA 2433F(KN-71-431(SR)). An abstract of DLC-21 is attached as the last pages of this newsletter for insertion in your copy of ORNL-RSIC-30.

CHANGES TO THE DNA WORKING CROSS SECTION LIBRARY

The tantalum-181 evaluation has been modified as summarized below:

Ta-181 MAT 4179
MOD 1 - January 1973

The (n,2n) cross section near threshold was revised to conform to the observed dip in gamma-ray production (ORNL-TM-3702). The (n,3n) and (n,n') cross-sections were modified to correspond to the (n,2n) changes. The (n,Xγ) component is represented as one discrete gamma ray (0.15 MeV) from the two lowest discrete levels with gamma rays from higher levels lumped into a continuum.

PERSONAL ITEMS

The following persons have notified RSIC about address or other career changes:

E. T. Boulette from WADCO Corp., Richland, Washington, to Stone and Webster Engineering Corp., Boston, Massachusetts; *Shiaw-Der Su* from Burns and Roe, Inc., Oradell, New Jersey, to Gulf Energy and Environmental Systems, San Diego, California; *G. L. Simmons* from Babcock and Wilcox, Lynchburg, Va., to Science Applications, Inc., Huntsville, Alabama. *T. Jordan*, formerly of A.R.T. in Los Angeles, California, is now an independent consultant.

V. J. Orphan reports that Gulf Radiation Technology has been acquired by Intelcom and is now known as Intelcom Radiation Technology. Intelcom advertises that it applies space technology to the practical needs of world-wide commercial markets.

S. T. Friedman, formerly of TRW Systems, Redondo Beach, California, is now spending almost full time lecturing to college and professional groups on "Flying Saucers ARE Real." He is also investigating interesting UFO sightings and would like to be informed by our readers of any sightings which they have observed. Names will not be publicized.

Francis J. Patti has been promoted to assistant chief nuclear engineer in the Power Engineering Division of Burns and Roe, Inc. He will continue as head of the company's Nuclear Analysis Section.

VISITORS TO RSIC

Visitors to RSIC during the month of January were: B. Dostert, California Institute of Technology, Pasadena, Calif.; D. C. Kaul, Defense Nuclear Agency, Washington, D. C.; H. Kuhns, Library, ORNL; M. M. Levine and L. M. Shotkin, Brookhaven National Laboratory, Upton, N. Y.; D. R. Miller, General Electric, Knoxville, Tenn.; W. G. Price, Princeton University, Princeton, N. J.; E. R. Schmidt and J. F. Strahl, NUS Corp.; Rockville, Md.; W. C. Stoddart, Gen. Engineering, and J. E. Corum, B. L. Greenstreet, H. C. McCurdy, Reactor Div., ORNL; J. R. Trinko, Ebasco Services, New York, N. Y.

JANUARY ACCESSION OF LITERATURE

The following literature cited has been ordered for review, and that selected as suitable will be placed in the RSIC Information Storage and Retrieval Information System (SARIS). This early announcement is made as a service to the shielding community. Copies of the literature are not distributed by RSIC. They may generally be obtained from the author or from a documentation center such as the National Technical Information Service (NTIS), Department of Commerce, Springfield, Virginia 22151.

RSIC maintains a microfiche file of the literature entered into SARIS, and duplicate copies are available on request. Naturally, we cannot fill requests for literature which is copyrighted (such as books or journal articles) or whose distribution is restricted.

Special bibliographies and selected computer-printed abstracts of the literature in the RSIC system are available upon request. The Selective Dissemination of Information (SDI) Service is available by submitting a list of subject categories defining the recipient's interests.

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AEC-TR-7138, pp.148-159; TT-70-50152, pp.148-159
Nomograms for Plotting Isodose Charts in Remote Gamma-Therapy.
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Photo Neutron Cross Section Measurements in the Energy Range 1-5 MeV.
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Compton Scattering from a Relativistic Maxwellian Distribution of Electrons by the Discrete SN Method. Technical Report Feb. 1970-Oct.1971.
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Progress Report on Nuclear Data Activities in India. VIII.
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CEA-CONF-2071
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Elie, X.; Martin, R.
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Proton-Recoil Proportional Counter for Neutron Spectrometry in Fast Reactors.
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Defect Development in Neutron-Irradiated Type 316 Stainless Steel.
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Emitted Radiation Characteristics of Plutonium Dioxide Radioisotope Thermoelectric Generators.
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Comparison of Neutron Spectra Measured with Three Sizes of Organic Liquid Scintillators Using Differentiation Analysis.
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Tritium Neutron Source and Fast Neutron Studies.
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Constant Anisotropic Scattering of Neutrons and Time-Dependent Neutron Transport.
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SPACE AND ACCELERATOR SHIELDING

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RSIC DATA LIBRARY DLC-21/KXRAY

1. NAME AND TITLE OF DATA LIBRARY

KXRAY: Evaluated X-Ray Cross Section Library.

2. NAME AND TITLE OF DATA RETRIEVAL PROGRAM

RDXRAY: A Program for Printing the KXRAY Data.

3. HISTORICAL BACKGROUND INFORMATION

This set of evaluated data for X-ray interactions is described in Refs. 1-3 and replaces an earlier compilation, also by Kaman.[4] Two other photon interaction libraries, DLC-7 and DLC-15, are also packaged as part of the RSIC Data Library Collection, but their energy range extends only to 1-keV. The emphasis of DLC-21 is toward lower energies, its range extending from 0.1 keV to 1 MeV, and the library provides data in an energy region not covered by the others.

4. APPLICATIONS OF THE DATA

For use in general purpose X-ray transport codes.

5. SOURCE AND SCOPE OF THE DATA

The procedure used in the evaluation and compilation of the X-ray library are described in Ref. 1. The first 34 pages of that report are supplied in the documentation provided with DLC-21. Additional useful information is given in Refs. 2 and 3.

Experimental X-ray attenuation cross sections for 94 elements for energies between 0.1 keV and 1 MeV were obtained for the period from 1920 through 1970. Exact photoelectric absorption values also were calculated for hydrogen. Scattering cross sections were calculated by relativistic SCF methods. These were subtracted from total attenuation data, and the resulting photoelectric and measured photoelectric absorption cross sections from 1 keV to 1 MeV were fit by a least squares procedure to obtain best values. Interpolations were made for elements and energy ranges for which there were no experimental data. In addition, from 0.1 keV to between 1 keV and 10 keV non-relativistic,

self-consistent, independent electron theory was used to calculate photoelectric absorption cross sections. Thus, for this energy range, values based on least squares fits and on calculations are given, with the calculated values recommended. Scattering values were added to all photoelectric cross sections to obtain a best set of attenuation cross sections.

Values are tabulated in units of barns/atom as a function of energy (keV). Data are given for photoelectric, coherent scattering, incoherent scattering, incoherent scattering (absorption component), and total attenuation.

6. DISCUSSION OF THE DATA RETRIEVAL PROGRAM

RDXRAY is a program to read and list the contents of a tape containing DLC-21/KXRAY.

7. CONTRIBUTOR

Kaman Sciences Corporation, Colorado Springs, Colorado.

8. DATA FORMAT AND COMPUTER

BCD or EBCDIC card image, IBM 360/75/91.

9. TYPICAL RUNNING TIME

To list the entire library using RDXRAY requires approximately 5 minutes on the 360/75.

10. REFERENCES

a. Documentation available with library

(1) Wm. J. Veigele, E. Briggs, L. Bates, E. M. Henry, and B. Bracewell, "X-Ray Cross Section Compilation from 0.1 keV to 1 MeV, Vol. 1, Rev. 1, Discussion and Results," DNA 2433F, (KN-71-431(R)), July 1971. The first 34 pages are packaged with DLC-21.

(b) Other documentation helpful in defining library

(2) Wm. J. Veigele et al., "X-Ray Cross Section Compilation from 0.1 keV to 1 MeV, Vol. II, Rev. 1, Input Data and Supplemental Results," DNA 2433F (KN-71-431(R)), July 1971.

(3) E. Briggs and Wm. J. Veigele, "Supplementary Report to X-Ray Cross Section Compilation from 0.1 keV to 1 MeV," DNA 2433F (K-72-431(SR)), August 1972.

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11. CONTENTS OF LIBRARY

The library package contains the following items:

a. the reference listed in section 10a above.

b. a reel of magnetic tape containing the library, program ROXRAY and sample input and output.

Persons requesting the library should send a full (2400 ft) reel of magnetic tape to the address listed below.

12. HOW TO OBTAIN LIBRARY

Inquiries or requests for the library may be mailed to:

DATA COORDINATOR
Radiation Shielding Information Center
Oak Ridge National Laboratory
P. O. Box X
Oak Ridge, Tennessee 37830

or telephoned to:

Area Code 615, 483-8611, extension 3-6944, or to
FTS xx-615-483-6944.

13. DATE OF ABSTRACT

November 1972.